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## FURTHER STUDIES AT VERO, FLORIDA

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In a recent number of this *Journal* there appeared a symposium on the age and relations of fossil human remains found near Vero, Florida.<sup>1</sup> The several investigators attacked the problem from quite different viewpoints and developed considerable difference of opinion. Later Dr. Sellards planned to spend an additional week at Vero with Dr. E. W. Berry in further study of the critical points involved in the case. He was good enough to invite the writer to join in this further inquiry, and this invitation was cordially accepted. As a result of the wider examination of essential points made possible by my second visit, I desire to amend and extend the interpretation of the history of the human bones and associated relics previously offered.

My studies on the first visit were given almost wholly to an endeavor to work out the physical history and time relations of the formations at Vero, as this was regarded as a step necessary to the safe interpretation of the relics embraced in them. This seemed especially necessary because the dates of the appearance of man and of the disappearance of the extinct animals were among the very points brought into question and could not themselves be used as decisive criteria. On the other hand, the nature and successions of the formations afford some of the most critical evidence bearing on these dates. It will perhaps be recalled that the history of the formations was found to be rather definitely deployed, and that the time relations of the deposits were quite well indicated by the physical criteria available, irrespective of their fossil contents. My former reading of this history was confirmed in all essential

<sup>1</sup> E. H. Sellards, R. T. Chamberlin, T. W. Vaughan, Aleš Hrdlička, O. P. Hay, and G. G. MacCurdy, "Symposium on the Age and Relations of the Fossil Human Remains Found at Vero, Florida," *Jour. Geol.*, XXV (1917), 1-62.

particulars by what was seen during the second visit. Its essentials are here recalled for the sake of the discussion following.

1. During a submergence of this portion of the east coast of Florida there was laid down a striking marine shell marl which has sometimes been called "coquina." It is the oldest formation exposed to view and has been referred without question to the Pleistocene. Though its precise place within the Pleistocene has not been determined, its fauna was essentially the same as that now living in the adjacent ocean. Following the deposition of the marine shell marl, a withdrawal of the sea gradually brought this region into the horizon of terrestrial action. In the transition, beach conditions prevailed, resulting in sandy deposits, partly marine, partly terrestrial.

2. At the appropriate stage in the withdrawal of the sea a barrier ridge was developed immediately to the west of the present location of the Florida East Coast Railway. This ridge parallels the railroad and the coast for many miles both north and south of Vero, and throughout most of its extent it is a pronounced topographic feature. West of it was a marshy area.

3. With further withdrawal of the sea a newer barrier ridge developed from two to two and one-half miles east of the earlier Vero beach ridge. This constitutes the present east coast of Florida. For over one hundred miles it incloses, between itself and the mainland, a salt-water lagoon, known as the Indian River.

4. After the withdrawal of the sea from the Vero beach ridge, erosion developed a channel in essentially the position now occupied by Van Valkenburg's Creek. The very low gradient and notable width of this channel in proportion to its very insignificant depth, which was limited by sea-level, suggest that erosion, which here was slow at the best, was in progress for a considerable time.

5. In the marshy region west of the Vero beach ridge bog deposits accumulated here and there. Cementation had also affected certain horizons of the sands of this tract and had converted them into a sandstone. This had been effected by the deposition of iron and manganese oxides as well as organic matter in the sands. The length of time involved in this process of conver-

sion of the sands into sandstone may well have been considerable, though it cannot be definitely measured.

6. But, whatever the length of this period, it is important to observe that *the filling of the channel of the creek* did not begin until *after the sand had been converted into black sandstone*, for water-worn pebbles of this black sandstone *are abundant in the basal portion of*



FIG. 1.—The present channel of Van Valkenburg's Creek, dry since the construction of the drainage canal in 1913. Shows the relatively slight depth of the channel.

*the channel fill.* They are in fact rather more conspicuous at the base of the fill than at higher levels, although occurring throughout. The special significance of these black pebbles, as brought out in the symposium, lies in the fact that they fix the date of the filling of the channel with respect to the old bog area to the west. The oldest fill in the creek channel is notably younger than the bog deposits of the uplands back of the main beach ridge.

7. The filling of the creek channel from this beginning up to the present has taken place in two stages, which appear to be quite

distinct in some portions of the channel, but which at some other points can be separated only with much doubt. At best they are thin, both of them together averaging only 5-7 feet in thickness, and they are quite changeable in composition. The lower of these has been designated formation No. 2 by Sellards and the upper one formation No. 3. In this paper the former will be termed the lower creek deposit and the latter the upper creek deposit. The bones and relics in question were found in these two creek deposits.

The discrimination of these successive stages of formation made it seem quite possible that the land life of the times began to occupy this region during the stages of emergence, and hence that bones of the extinct mammals and other vertebrates might have accumulated in the marshy area to the west of the Vero beach ridge in Pleistocene times, following not long after the coquina stage, and that later, as Van Valkenburg's Creek gradually cut back into this area, these old Pleistocene bones were washed into the stream channel and concentrated in the creek deposit, while at this later time there mingled with them relics of the more recent vertebrates and plants, as well as human remains.<sup>1</sup> Thus the deposit of the stream channel might contain fossils of quite different ages in intimate association. The geologic conditions and the sequence of events seemed such as to suggest and to support this hypothesis.

On the assumption that the extinct mammals were perhaps as old as Middle Pleistocene—as was then urged—and that the coquina formation which underlies the region could not well be interpreted as much older than this—if indeed as old, since all of its fossils belong to living species—there seemed to be rather urgent reasons for presuming that at least the older of the extinct mammals invaded the region as soon after its emergence from the sea as conditions permitted. They were therefore supposed to have been present during the formation of the marsh deposit back of the beach ridge, and to have, in all probability, been buried in it, and their relics derived from it in the subsequent trenching and filling by Van Valkenburg's Creek. The finding of balls of black sandstone from the marsh deposit in both the older and the younger creek deposits seemed to fit at once, and help explain, this very

<sup>1</sup> Symposium, pp. 25-39.

puzzling combination of bones of extinct animals of supposedly Middle Pleistocene age mingled with fragments of human pottery of almost obvious recency.

The actual presence of bones of the extinct animals in this Pleistocene marshy area was not observed, for, on the first visit, time did not permit an adequate examination. And so a leading

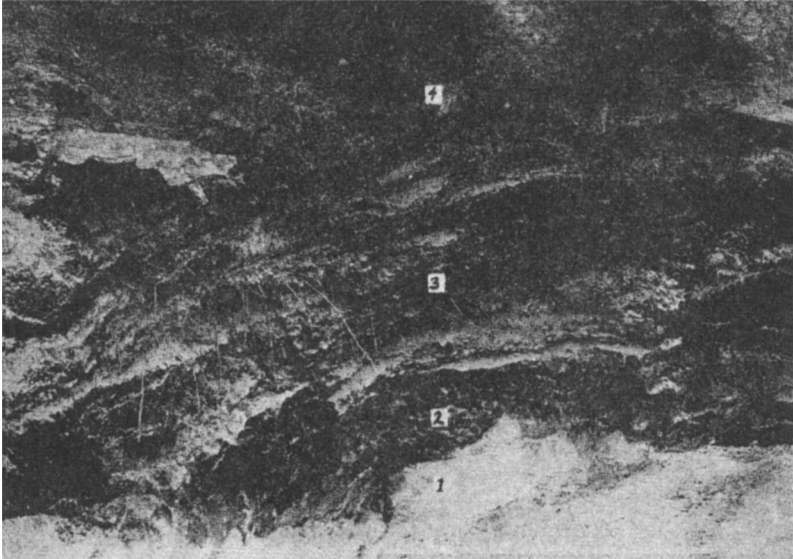


FIG. 2.—The formations of the creek section exposed by digging into the south bank of the canal near point marked *N* in Fig. 4. No. 1 represents the marine shell marl (coquina) grading upward into light-colored sands; No. 2 is the lower creek filling of variously stained sands (Sellards' formation No. 2); No. 3 represents the upper creek filling (Sellards' formation No. 3), consisting of alternate layers and lenses of sand and muck; No. 4 is the loose dump material piled on the surface in excavating the canal.

purpose of the second visit was to search the older upland formations for direct fossil evidence on this point. This search was not successful in finding bones of the extinct animals, either *in situ*, or in the canal dump from the upland area through which the two forks of the creek have cut. The conditions that prevailed at the time of the marsh deposit to the west of the barrier ridge seem to have been inhospitable to life of the types of the extinct animals

in question, or else the nature of the formation was unfavorable to their preservation. This, of course, is not conclusive evidence that they did not then live in the region, but it greatly weakens the hypothesis that bones deposited in these beds were sources of supply to the creek deposit after the analogy of the black pebbles.

Bones as well as coarser fragments of any durable material should, of course, tend to become concentrated in a stream bed as the finer inclosing sands are washed downstream. This is a well-recognized principle and it might well account for the fact that bone fragments are rare in the upland formations and numerous in the creek channel deposits. But whether this selective concentration of coarser fragments in the channel by the action of the stream is quantitatively adequate to explain the difference is questionable, and it is not wise to appeal to it unless all other explanations fail. The solution of the riddle of the mixture of the bones of extinct animals with human bones and pottery was therefore sought on other lines.

It is true that, at a point three miles west of Vero, Dr. Sellards had found the wreck of a proboscidian in a fresh-water marl deposit close to the surface and referable to the general upland deposit back of the beach ridge.<sup>1</sup> Dr. Sellards had also recognized a fauna similar to that found in his formation No. 2—the lower creek deposit—in a fresh-water marl bed belonging to the upland deposit at a point about 1,700 feet east of the Florida East Coast Railway bridge, i.e., *downstream* from the deposits which contain human relics. Both these facts seem to imply that a fauna of the general type found in the lower creek deposit occupied the region at some time during the formation of the upland deposits, and to this extent they support the general correctness of the inferences entertained in my contribution to the symposium, but they do not support the specific view that the bones of the lower creek deposit were in any large measure derived from the lagoon, or marsh, deposit of which the indurated black sand is a part.

These facts also weaken the presumption that the relics of the extinct animals really imply so great age as Middle Pleistocene. Dr. Hay, who favored the view that they were closely related to

<sup>1</sup> Symposium, p. 55.

the fauna of the Aftonian inter-glacial beds of Iowa, yet recognized that "this fauna might have continued on for another stage or two, but by the time of the Illinoian drift it had become essentially modified."<sup>1</sup> It is further to be recognized as not improbable that this fauna may have lingered longer at the south than it did at the north, where the advances and retreats of the ice border were putting the fauna under the stress of an oscillating climate.

The marine coquina deposit, which lies below all the upland beds and the creek deposits as well, does not bear evidence of great age, its shells being all of living species. This deposit, or perhaps more strictly the beach sands into which it grades upward, are referred by the geologists of this and adjoining states to what has been termed the third or lowest Pleistocene marine terrace formation. The age of this terrace was assigned by Matson to late Pleistocene.<sup>2</sup>

There are good reasons, therefore, in the stratigraphy and the topographical aspects of the deposits at Vero, for regarding the extinct mammals and other vertebrates as continuing to a relatively late date. The aspects of the problem thus developed made a closer scrutiny of the two creek deposits more imperative, for, as we have seen, both of these deposits were late in the history of the formations of the region, and the oldest of these formations bears both a paleontological and a topographical aspect of relative recency.

This closer scrutiny at the time of the second visit developed evidence both for and against the point previously made by Dr. Sellards that the delicate condition of the fossils—as well as their grouping—was not consistent with the view that they were derived from an older formation by stream action. Dr. Sellards put forward an increasing number of fossil remains which, on account of their fragile nature, or because of the close association of various bones, he did not believe could have suffered transportation or much disturbance since fossilization. That an occasional specimen of this sort need not be of much significance was pretty effectually established by the finding, among a half-dozen fragile

<sup>1</sup> Symposium, pp. 54-55.

<sup>2</sup> *Ibid.*, p. 40; G. E. Matson, "Geology and Ground Waters of Florida," *U.S. Geol. Surv., Water Supply Paper* 319, 1913, pp. 31-35.



carapaces of turtles, of one specimen still firmly holding together and undoubtedly still capable of being swept along by a stream for a considerable distance without being torn to pieces. But the cumulative evidence of the cases presented suggested strongly that various particular individuals, at least, were primary fossils but little disturbed since entombment.

On the whole, it seems to me that Dr. Sellards has strengthened his view that at least an essential part of the fossils of the lower creek deposit are primary to that deposit, and that the extinct animals represented by these fossils were denizens of the region as late as the formation of the lower creek deposit, Sellards' formation No. 2. This does not entirely dispose of the hypothesis that some of them were washed in from the older deposits in the process of stream-cutting and stream-filling, but it renders that possibility less vital to the essential question—the time of man's appearance in this region. At the same time, of course, it brings the time of extinction of the fauna of the lower creek deposit down to a relatively recent date.

It, however, left the critical feature of the problem—the admixture of extinct animals with human remains, pottery, and bone implements of modern aspect—still crying for a satisfactory explanation. The crux of the whole problem seemed to be thrown upon the trustworthiness of the discrimination between the upper and the lower creek deposits. Now these upper and lower deposits altogether measure only about 6 feet in thickness on the average. This is a pretty thin deposit to divide into two distinct ages when the natural irregularity of such deposits is considered, and when the composition of the earlier and the later deposits is so nearly the same as it is in this case. The upper creek deposition reaches down to the year 1913, when the digging of the drainage canal put an end to the activity of this portion of Van Valkenburg's Creek, and thus the occurrence within it of pottery, bone implements, and the remains of man is altogether what one might expect. But the presence of these same relics in the lower creek deposit would tell a different story. It therefore becomes imperative to note sharply in just what portions of the creek filling the significant relics were found. It is also equally important to determine critically in what

horizons within the creek deposits the undisturbed individuals of the extinct vertebrates occur. Creek deposits, by their very nature, imply changing conditions from time to time.

Dr. Sellards had appealed to, as evidence against the secondary nature of the fossils of the old vertebrates, a number of bone assemblages, such as a tapir skull, a wolf's head, an armadillo,

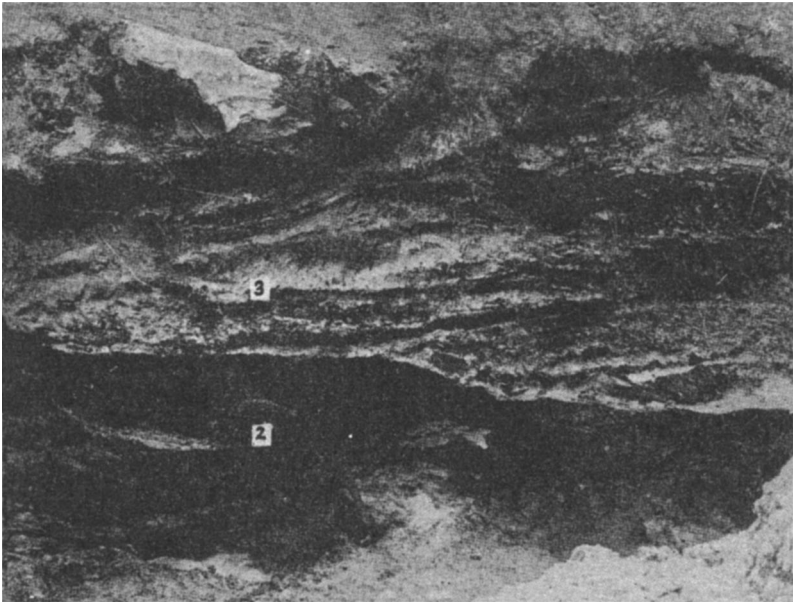


FIG. 3.—View showing a distinct dividing line between the lower creek filling (No. 2) and the upper creek filling (No. 3). Lenses and irregular patches of material in both formations rapidly pinch out, showing considerable scour and fill. Location close to that of Fig. 2, but at a different stage in the progress of the exploratory digging in March, 1917. At the base is the underlying formation No. 1; at the top is the canal dump piled on the surface. Note the thinness of the creek fillings.

turtle carapaces, etc., which he did not believe could have been moved since fossilization. In going over the list one by one with Dr. Sellards, it developed that the fossils of old extinct forms which seemed to him to necessitate the belief that they have not been rewashed, were found in formation No. 2 (the lower creek deposit) and in general rather well down in it. Here must perhaps be

excepted the turtles, but the finding of one very firm carapace near the junction of the two deposits would seem to throw much doubt upon arguments based upon the turtles. If it be admitted, then, that such of these fossils as cannot readily have been transported from elsewhere since fossilization are primary to the lower creek deposit, that would mean that this earlier creek filling is of the same age as these particular types, and so its age is determinable from these types provided they afford decisive evidence. But a development of scarcely less significance in the ultimate interpretation was the bringing out of this very fact that the undisturbed specimens of extinct vertebrates were taken wholly, or chiefly, from the lower creek deposit.

On the other hand, according to the published accounts of Dr. Sellards, the bones of the extinct vertebrates found in the upper creek deposit are much scattered, commonly a few teeth, or a lower jaw, or fragments of one or two other bones.<sup>1</sup> In this condition they do not seem to the writer to preclude more or less reworking by the creek, but rather to imply it.

Next let us consider the location of the human bones and artifacts. On the north bank of the canal the human relics thus far found have come exclusively from the upper creek deposit. No evidence of the presence of man has yet been discovered in the lower creek deposit on the north bank of the canal. At the same time it strikes the writer as an observation equally to be emphasized that the two creek deposits are quite distinct from one another throughout this section along the north bank of the canal. In this section the observer feels little hesitation in drawing the dividing line, and different investigators readily place it at the same level. It can scarcely be without significance that the human relics found thus far in the north bank of the canal all lie *above* this well-marked dividing line, while the vertebrates of greatest age, and those which present the best basis for the claim that they cannot have been reworked, lie *below* this line.

All the human relics reported to have come from the *lower* creek filling were found in the *south* bank of the canal, and were

<sup>1</sup> E. H. Sellards, "Human Remains and Associated Fossils from the Pleistocene of Florida," *Eighth Ann. Rept. Florida Geol. Surv.*, 1916, pp. 147-52.

obtained from points marked *M* and *N* on the contour map (Fig. 4). It was at point *M* that the original discovery of human bones was made by Mr. Frank Ayers in October, 1915. But since that time the bank at this point has been cut back five or six feet in further search for bones, so that the exact resting-place of this first find of bones can no longer be viewed. According to the description given by Dr. Sellards, these human remains, or skeleton No. 1 as it

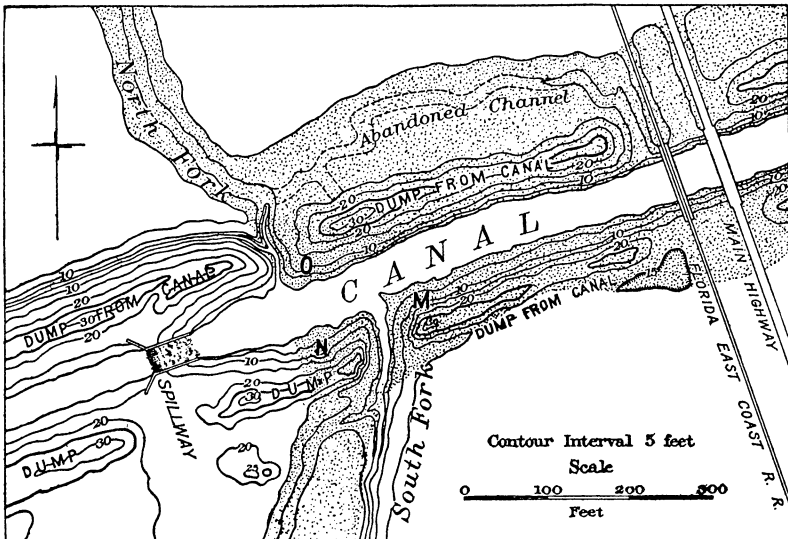


FIG. 4.—Detailed map of the locality where the human bones were found. The canal and the resulting dump piles have done much to change the original topography. The dotted area represents the flood-plain of Van Valkenburg's Creek as it appears to have been just prior to the digging of the canal. The first human skeleton was found at point marked *M*, the second at point marked *N*, while human relics were found also at point *O*. (Reproduced from Symposium, p. 26.)

may be called, were imbedded in brown sand about two feet from the surface of the ground as it existed previous to the construction of the canal.<sup>2</sup> Of these two feet, nine inches, next above the bones, consisted of brown sand, above which lay one foot three inches of sandy, fresh-water marl. All of this was originally assigned to the lower creek fill. If this be correct the upper filling is wanting at

<sup>2</sup> *Op. cit.*, pp. 131-32.

this place. But in his symposium paper Dr. Sellards had come to regard this marl as probably equivalent to formation No. 3 (upper creek fill),<sup>1</sup> and in that article assigned to it a thickness of 18 inches.<sup>2</sup> Only a few inches of brown sand therefore remain as a basis for referring the bones to the lower creek deposit in a case in which the correct reference is a matter of critical importance. The case accordingly does not seem to the present writer to be one that may safely be regarded as conclusive.

The other human remains reported from the lower creek deposit were obtained in the extensive diggings carried on at the point marked *N* in Fig. 4. In the section at this point the lower fill shows extreme irregularity. This is assigned to subsequent scour and fill, evidences of which are more marked here than anywhere else in the sections exposed by the canal excavations. Cutting by the stream has been so pronounced that, in the midst of the area over which the bones are scattered, the lower deposit has at one point been completely removed, and the upper filling rests in a depression cut into formation No. 1 (the underlying marine beds).<sup>3</sup>

A few feet to the west of this more human bones were found along the contact line of formations Nos. 2 and 3 (the upper and lower creek deposits), or slightly within the basal portion of the upper creek deposit. Because of the close association of these two finds, because there is no duplication of parts, and because all the bones came from a large individual, Dr. Sellards believes that the bones mentioned in the last paragraph and referred to the lower fill and those here mentioned as found a few feet to the west along the contact of the two fillings, all belong to the same skeleton.<sup>4</sup> This may be called skeleton No. 2.

If these bones all belong to one skeleton, the fact that a part of them were found in formation No. 2, as interpreted by Dr. Sellards, and a part of them in the base of formation No. 3 requires explanation. This naturally led to the suggestion that those bones which were found in the basal portion of the upper fill reached that position by being washed out of the lower deposit.<sup>5</sup> If, however, one examines Fig. 6 of the Florida state report, it is seen that the bones

<sup>1</sup> Symposium, p. 17.

<sup>2</sup> *Eighth Ann. Rept.*, etc., Fig. 6, p. 137.

<sup>3</sup> *Ibid.*, p. 22.

<sup>4</sup> *Ibid.*, p. 142.

<sup>5</sup> Symposium, p. 54.

found in the basal portion of the upper deposit are *upstream* from the point where the bones in the lower deposit occur. Besides this, two out of the three bones are figured as occurring at a considerably higher level than the bones in the lower deposit. At the same time the attitude and appearance of these suggest that they had already moved somewhat down the rather steep slope implied by the depositional lines.

These suggestive relations occur at the most critical locality. It was here that most of the collecting was done, not only during this later visit, but also during the previous one. From the geological point of view this section is peculiar in that here there has been more obvious scour and fill by the stream than elsewhere. This is made evident by an unusual number of pockets and lenses of sand and muck, as well as rapid dovetailings of layers. It may be worthy of note also that the section here lies beneath the latest channel of Van Valkenburg's Creek. The pockets, "filled holes," lenses, and dovetailings render the identification of the true line between the lower and upper creek deposits both difficult and uncertain. While the line of division is reasonably distinct at most points elsewhere, as on the north bank already noted, it unfortunately becomes obscure in this critical section.

In the course of our examinations there frequently arose questions as to the line of division between the upper and lower deposits, and sooner or later the judgments of all members of the party were more or less involved in these efforts at discrimination. These questions revealed the fact that there were notable differences of opinion as to whether a given bit of a section belonged to the upper or lower deposit. If, as discussion and critical consideration proceeded, there was noticeable a tendency to shift the dividing line in one direction rather than another, it was to give the base of the upper creek filling a lower place in holes and hollows than it had been assigned before. In other words, there was a general disposition, as the result of progressive study, to lower the division line. This justifies the inference that any sharp division of the creek deposits in this portion of the south bank into distinct formations is lacking in complete conclusiveness.

A specific case of this kind of uncertainty is illustrated by Fig. 5. As a result of much digging for fossils at this point, the bank had gradually been cut back till, at the taking of this picture, it was perhaps 15 feet back from its original canal face. The entire thickness of the deposit from the base of the black muck and sand fill

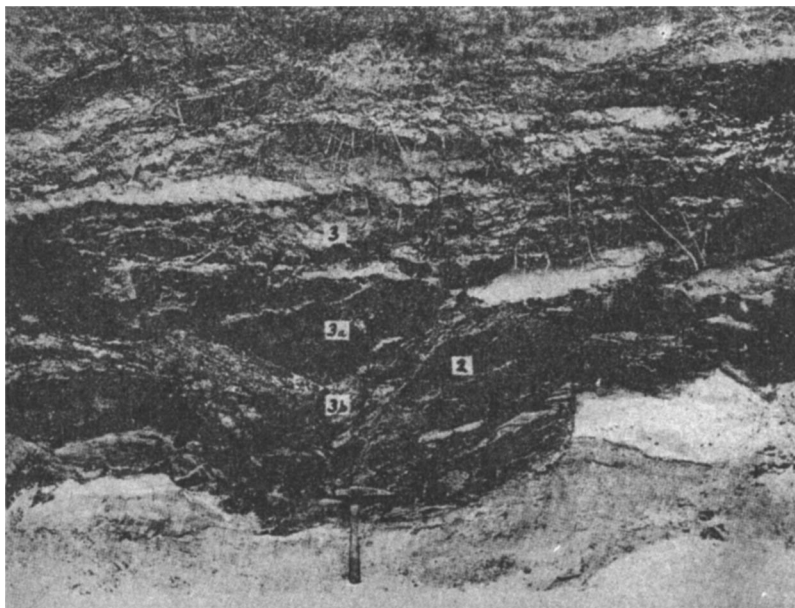


FIG. 5.—Section of south bank of the canal near point marked *N* (Fig. 4) as exposed by the party on March 21, 1917. At the base are buff marine sands with some shells (formation No. 1); No. 2 above is the lower creek fill which was originally supposed to extend up to the prominent line of white sand lenses, just beneath marker 3 in the middle of the picture; but upon more critical inspection, the patches of fill marked 3*a* and 3*b* were excluded from the lower fill and placed in the upper fill. No. 3 represents the unmistakable upper creek fill. It contains some small lenses and pockets of marine shells derived from formation No. 1.

(just to the left of the hammer) to the surface as it was in 1913, just prior to the excavation of the canal, is  $5\frac{1}{2}$  feet. As the party viewed the newly exposed section for the first time, all were ready to carry the upper creek filling down to the prominent line of whitish sands and reworked coquina shells just beneath marker 3 in Fig. 5. After a brief inspection, there seemed to be reasons for assigning the block

marked 3a (Fig. 5) to the upper creek deposit. And then the upper deposit was extended downward to include the peculiar funnel-like fill marked 3b, while the writer, at least, would hesitate to deny that the upper deposit might not, in reality, include also some of the material which reposes in lenslike fashion adjacent to this funnel. In any case it is clear that there was much scouring and filling at this point, and this involved the lower as well as the upper deposit. This suggests that the scour and fill arose from the course of the stream at this point—some turn, perhaps, or some configuration of its channel.

The peculiar funnel-like filling marked 3b was so obvious as to suggest the name "funnel," as it was evidently a deep hole in the creek bed filled with alluvium. After the photographs were taken, further excavations were made, and at the bottom of the funnel the carapaces of two turtles were found. One of these, still firm and strong, has already been referred to (p. 676). With further horizontal digging into the bank the funnel quickly disappeared.

This particular locality has been a gold mine for bone-collecting, and far more excavating has been done here than at any other point. The writer suspects that one reason why this particular area has proved so prolific in results is that there was an exceptional reworking of material by the stream at this point, resulting in a greater concentration of bones, pottery, and coarser material. At the same time, this material was left in more unusual positions than in places where the stream action has been simpler. In fact, small lenses and stringers of shells derived from the erosion of the underlying marine coquina are frequently seen here, not only in the lower creek deposit, but in the upper creek deposit as well. If, then, the upper creek deposit has received an appreciable portion of its material from the more deeply buried marine beds, how much more of its material must have been derived from the far more accessible lower creek deposits which overlie these marine beds. The mixing of materials is obvious.

In view of the similarity of the upper and lower creek deposits, and the inevitable difficulty of drawing a perfect line of division between them; in view of the actual differences of opinion as to



just where such line should be drawn, and of changes of opinion once formed; in view of the natural doubt as to whether two such deposits measuring together only about six feet could in fact remain altogether unmixed and distinct; and in view of the observed fact that the stream, in its later action, actually did cut entirely through its own earlier deposits and into the marine formation below, it would seem that grave doubts as to the trustworthiness of correlations of this stream material may well be entertained. Perhaps it is obligatory that they should be entertained. The balance of evidence seems to lie in favor of including all doubtful horizons in the upper fill, since the upper fill does penetrate deep into the lower fill at so many points. The human bones and relics would seem to the present writer to belong to the upper creek deposit, which was contemporaneous with the human occupation of Florida. This interpretation would allow the correctness of Dr. Sellards' contention that the bones of the extinct vertebrates well down in the undisturbed part of the lower creek deposit are fossils primary to that deposit. With this revision of the stratigraphic view, the testimony of the inherent character of the human relics rises into scarcely less than decisive importance.

Now, among the human relics, the pottery seems to carry the most telling testimony as to the time when the aborigines dwelt on the banks of Van Valkenburg's Creek. The association of the pottery with the human bones may well be regarded as peculiarly significant, for the pottery was a human product and it carries a time relation. Fragments of pottery, in more or less abundance, were found on the second visit at as low a horizon in the creek deposits as were any of the human bones. The writer saw no evidence of any human race earlier than the pottery-makers, and no such earlier race has been claimed. Now, as MacCurdy,<sup>1</sup> Hrdlička,<sup>2</sup> and Holmes<sup>3</sup> have pointed out, the pottery belongs to the type which was used by the mound-building Indian tribes of Florida. Such pottery was in common use in the middle or later Neolithic age. This pottery, of itself, would not therefore be assigned a date earlier than mid-Recent. Even in Europe, where the presence and

<sup>1</sup> Symposium, pp. 60-62.

<sup>2</sup> *Ibid.*, pp. 47-50.

<sup>3</sup> *Ibid.*, p. 51.

development of man has been traced from the mid-Pleistocene on, the introduction of pottery by Neolithic man is not placed as far back as the close of the Glacial period and is not, therefore, Pleistocene as usually defined. There is no ground to suppose that pottery was in use in North America before it was in use in the Old World; more probably it was introduced here later.

If (1) the testimony of the human relics, particularly that of the pottery, be taken at its apparent paleontological value; if (2) the upper creek fill, whose accumulations demonstrably continued on until 1913, be regarded as embracing all the human relics, as seems quite consistent with the physical evidence; if (3) the critical extinct vertebrate fossils found in this upper creek fill be regarded as derivatives from the lower creek fill; and if (4) the lower creek fill be regarded as contemporaneous with the last living stages of the extinct vertebrates whose fossils it holds as primary inclusions, as Dr. Sellards contends, the whole history becomes consistent physically and paleontologically, and the gist of its lesson is that the Pleistocene fauna lived longer in this genial southern clime than it has been credited with in the more northern latitudes, while the evidence of man's presence here falls into harmony with the general tenor of other evidences which fail to assign him an antiquity beyond the mid-Recent.